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Research article

Application of Tens and William Flexion Exercise in Patients With Non Spesific Low Back Pain

Sri Gunda Fahriana Fahruddin[1]*, Rizqi Nurul Inayah[2], Sri Yani[3]

[1]Prodi Fisioterapi, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia
[2]Prodi S1 Fisioterapi, STIKES Rustida Banyuwangi, Indonesia
[3] Prodi Fisioterapi, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia
*Corresponden Author: Sri Gunda Fahriana Fahruddin (srigunda@upnvj.ac.id)

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ABSTRACT

Background: Non-Specific Low Back Pain is a musculoskeletal disorder caused by abnormalities or dysfunctions in musculoskeletal structures without any neurological involvement. This condition is most commonly found in workplaces, especially among individuals who perform activities with incorrect body posture. Non-specific LBP may result from muscle strain or lack of spinal movement, which leads to weakened or tense back muscles.
Methods: This study aims to determine the physiotherapy management using a combination of Transcutaneous Electrical Nerve Stimulation (TENS) and William Flexion Exercises in reducing pain and improving mobility in patients with non-specific low back pain. The study employs a descriptive quantitative approach with a case study design. TENS was applied to the lumbar area for 15–20 minutes using conventional frequency, combined with progressively performed William Flexion Exercises over a period of two weeks. Pain was assessed using the Visual Analog Scale (VAS), and functional ability was evaluated using the Oswestry Disability Index (ODI).
Results: The results showed a significant reduction in pain levels based on VAS scores and an improvement in functional ability as indicated by ODI scores after the combined therapy.
Conclusion: The combination of TENS and William Flexion Exercises is effective in reducing pain and improving function in patients with Non-Specific Low Back Pain.

I. Introduction

Low Back Pain (LBP) is a highly prevalent musculoskeletal disorder, affecting nearly 80% of the adult population at some point in their lives. This condition predominantly involves the lumbar region, specifically the area between the lower ribs and the gluteal region. The etiology of LBP is often associated with dysfunction or pathology of the neuromusculoskeletal structures in the lower lumbar spine, including muscles, nerves, vertebral segments, and intervertebral discs (Mujianto, 2017).
Nonspecific low back pain (LBP) is a musculoskeletal disorder that may result from a combination of musculoskeletal conditions, psychological factors, or improper body mechanics. The pain typically originates from the spine, musculature, nerves, or surrounding anatomical structures. This type of LBP often develops due to muscle strain or reduced spinal mobility, which can lead to muscle weakness or excessive tension in the back. The pain is usually confined to the region between the inferior border of the last rib and the gluteal fold, and remains localized without radiating (Tanderi et al., 2017).
Non-specific low back pain (LBP) is a leading cause of decreased work efficiency and constitutes one of the primary reasons for seeking healthcare services. This condition significantly disrupts work

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productivity, generating both direct and indirect economic burdens. Non-specific LBP is highly prevalent, with an estimated 70–80% of the population experiencing it at some point in their lives. The annual prevalence rates range between 15% and 45%. (Pombu et al., 2019).

Non-specific low back pain (LBP) frequently leads to restrictions in functional activities, contributing to elevated rates of absenteeism in various regions globally. This condition imposes a substantial economic burden not only on affected individuals but also on families, communities, industries, and government systems (Kasrina et al., 2020). The global age-standardised point prevalence of LBP (from 0 to 100 years) is estimated to be 9.4%, higher in men (mean: 10.1%; 95%) compared to women (mean: 8.7%; 95%), LBP is suffered by young and old but is more severe at the age of 30-60 years and above. (Pristianto et al., 2021).

Physiotherapy plays a crucial role in managing nonspecific low back pain by offering interventions aimed at alleviating the associated symptoms and functional limitations. Among the physiotherapeutic treatments available, Transcutaneous Electrical Nerve Stimulation (TENS) and William Flexion Exercises are commonly employed to help reduce pain and improve mobility.

Several theories have been proposed to explain the mechanisms underlying the effects of Transcutaneous Electrical Nerve Stimulation (TENS), including nociceptor inhibition, disruption of pain signal transmission in afferent nerves, sympathetic blockade, the gate control theory, and the stimulation of endogenous opioid release. The gate control theory serves as the primary framework for understanding the analgesic effects of TENS, wherein the stimulation of large-diameter A-beta fibers suppresses the activity of smaller A-delta and C fibers responsible for pain transmission. Additionally, high-intensity TENS is thought to produce analgesia by engaging descending inhibitory pathways, while high-frequency TENS (80–100 Hz) is believed to activate the gate control mechanism through selective stimulation of A-beta fibers (Beckwée et al., 2012).

Additionally, electrotherapy modalities such as Transcutaneous Electrical Nerve Stimulation (TENS) are frequently employed in the management of nonspecific low back pain (NSLBP). A randomized controlled trial conducted in the United States demonstrated that the application of TENS at maximum intensity effectively reduced pain and improved functional outcomes in the short term (Liebano, 2024)

However, a WHO review in 2023 stated that the effectiveness of TENS is still moderate and the effect may not always be clinically significant (Verville et al., 2023) Nevertheless, recent findings indicate a potential benefit when combined with other interventions.

William Flexion Exercise, also known as lumbar flexion exercise, is a series of physical exercises designed to increase flexion (forward bending) of the lumbar area. The aim is to reduce pressure on the posterior structures of the spine such as the facet joints and intervertebral foramen, and strengthen the abdominal and gluteal muscles, while stretching the extensor muscles.

Studies in India and Indonesia show that WFE can significantly reduce pain intensity, for example in the elderly in Binjai with a >50% reduction in pain scores in 4 weeks (Amila et al., 2021). Based on these findings, the combination of WFE and TENS can theoretically have a synergistic effect in reducing pain and increasing mobility in NSLBP patients. Studies on this combination of therapies are still very limited, so the need to evaluate its effectiveness empirically is still high.

Based on the aforementioned explanation, the researcher is interested in conducting a more in-depth investigation on this topic, as outlined in the research titled Application Of Tens And William Flexion Exercise In Patients With Non Spesific Low Back Pain.

II. METHODS

This research uses a case study method, which is a research that explores 1 type of case with 1 sample, and provides physiotherapy treatment or intervention for the sample during the study and evaluates the results that have been obtained.

The research was conducted at the Tresna Werdha Social Department starting in March-April 2025.

The data collection procedure is divided into two, namely primary data obtained from physiotherapy examination and measurement procedures for patients who are sampled. The physiotherapy examination of Non-specific low back pain includes history taking, inspection, motion examination, and specific examination. Physiotherapy measurements that will be carried out as an evaluation of the success of therapy are pain measurements and measurements of functional abilities. While secondary data is data obtained from the clinic in the form of medical records.

Pain Evaluation Using VAS

Table 1. Results of Pain Evaluation Using VAS

Pain	T1	T2	T3	T4
Silent	2/10	1/10	0/10	0/10
Motion				
Lumbar	7/10	6/10	6/10	5/10
Flexion	3/10	2/10	2/10	2/10
Lumbar				
Ekstension				
Pressure	4/10	2/10	1/10	1/10

Functional activity evaluation results using ODI

Table 2. Functional activity evaluation results using ODI

Terapi	Hasil
T1	62% (Severe Disability)
T2	48% (Moderate disability)
T3	36% (Moderate disability)
T4	24% (Mild disability)

The results of measuring pain and measuring functional activity pre (T1) and post (T4) giving interventions for 4x to respondents showed an increase in functional activity after the intervention.

III. DISCUSSION

The assessment results using the Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI) demonstrated that the combined intervention of Transcutaneous Electrical Nerve Stimulation (TENS) and William Flexion Exercises (WFE) significantly reduced pain levels and enhanced functional abilities in patients with Non-Specific Low Back Pain (NSLBP).The decrease in VAS scores from silent, motion, and pressure pain showed a positive response to the intervention for 4 meetings. Similarly, the ODI score decreased from 62% (severe disability) to 24% (mild disability), indicating significant functional improvement.

These results are in line with the findings of Hamidah et al. (2022) showed that the combination of TENS with William Flexion Exercise (WFE) for four therapy sessions proved effective in reducing pain, increasing muscle strength, and expanding the scope of motion in non-specific LBP patients. The value of silent pain decreased to 0, motion pain from 6 → 2, and pressure from 5 → 1; the scope of motion and muscle strength increased from 2 → 4 significantly. This is in line with the expected synergistic effects of passive (TENS) and active (WFE) interventions, strengthening the physiological and functional mechanisms of patients.

Separately, several recent local studies support the effectiveness of WFE in various populations. Setiawan et al. (2022) found a ~66% reduction in VAS pain (from 5.6 to 1.9) after six 2-week WFE training sessions.

Puspita Wulandari et al. (2023) reported a significant reduction in pain in woodworkers after 8 WFE exercises over four weeks. These findings indicate that WFE is effective across populations and clinical settings, both myogenic and non-specific cases.

In a control trial, Anung et al. (2023) compared a WFE intervention group with a control group in myogenic LBP patients, and found significant improvement in functional ability (mean pre-post: 7.5 vs 2.4). This confirms that the success of WFE is not only limited to pain, but also includes daily functional aspects.

Despite the prominence of WFE, a recent international RCT (2024) with a long term design concluded that lumbar extension exercises provided greater pain improvement (~1.5 point reduction on the pain scale compared to flexion exercises after 12 months, p=0.002).
In general, recent research in the last 5 years supports that WFE is effective and safe for reducing pain and improving function in NSLBP, either alone or with the addition of modalities such as TENS. The emphasis on active training, multimodal interventions, and individualised approaches according to patient preferences is increasingly supported by scientific evidence, but larger-scale trials are still needed for generalisation of results.
These findings are in line with a study that reported a decrease in motion pain from 6 to 2, tenderness from 5 to 1, and increased muscle strength and range of motion after a combination of TENS and WFE (Supatmi et al., 2024). In addition, the effectiveness of WFE in reducing pain and increasing flexibility found a 66% reduction in pain after six sessions of WFE training (Setiawan and Widiyanto, 2022)
Similarly, other studies have also reported a significant reduction in pain among workers suffering from non-specific low back pain (LBP) (Dalem et al., 2018). These findings are consistent with the results of a study that reported that the administration of William Flexion Exercise for four weeks significantly decreased pain and improved activity function in NSLBP patients (Kaple and Phansopkar, 2023). The use of WFE has also been shown to be effective in various populations, such as weavers (A, Damayanti S and Krisnawati, 2021) and woodworkers (Dalem et al., 2018), thus supporting that this intervention can be applied in various clinical settings.
Meanwhile, TENS therapy has been shown to provide short-term analgesia effects through the Gate Control Theory mechanism, as reported by (Apeldoorn et al., 2024) and reinforced by (Liebano et al., 2024), although WHO assesses the effectiveness of TENS is still moderate if used as a single therapy (WHO, 2024). Therefore, combining TENS with active exercises such as William Flexion Exercises (WFE) has been shown to be more effective, as evidenced by findings indicating a greater reduction in pain and disability in the group performing active exercises compared to those who received TENS alone (Jalalvandi et al., 2022).

Other studies have also confirmed the importance of lumbar flexibility and stability exercises in the long term, although extension exercises showed slightly better results than flexion (Park et al., 2024). Nevertheless, flexion exercises such as WFE are still recommended, especially in patients with extension motion intolerance or specific clinical indications such as spinal stenosis, as described by McKenzie and supported by the global physiotherapy community.
In addition, recent studies have demonstrated that combining William Flexion Exercises (WFE) with other therapeutic modalities, such as Kinesio Taping, can further enhance the effectiveness of treatment in reducing pain and improving functional outcomes in individuals with non-specific low back pain (Nana Aulia Massakuta and Ulfa Diya Atiqa, 2025) or cryotherapy may provide additional results in pain reduction and functional improvement (Windiastoni, Basuki and Haritsah, 2023). Other studies have also shown that joint stabilisation exercises, including those around the pelvis and ankle, contribute to the management of NSLBP (Abdelhaleem et al., 2023).
Overall, scientific evidence in the last five years supports that the most effective management of NSLBP is through a multimodal approach, which combines passive modalities such as TENS with active exercises such as WFE, along with posture modification, ergonomics and patient education. This approach has been proven not only to effectively reduce pain but also to enhance functional ability, flexibility, and overall quality of life in patients, as evidenced by various studies conducted both locally and internationally. Therefore, the combined application of TENS and William Flexion Exercises is strongly recommended in clinical physiotherapy practice, particularly for managing cases of non-specific low back pain with appropriate clinical indications.

IV. CONCLUSION

The combination of TENS therapy and William Flexion Exercises administered over four intervention sessions demonstrated positive outcomes in reducing pain intensity and enhancing the functional ability of patients with Non-Specific Low Back Pain. This combined approach has proven to be effective for short-term application in clinical physiotherapy practice.

V. CONFLICTS OF INTEREST

No conflict of interest was found during the research.

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